

side it as the greatest of their possessions. The earliest express mention made of it as a fuel was about 500 years before the Christian era, in the writings of Theophrastus the pupil of Aristotle, who speaks of it as being found in Siguria (now the province of Ivel) west about 300 miles before the Christian era, where it was used by smiths. I should be said to have been used by the ancient Britons, it is not until the 13th century that it is first mentioned in the English language, and it was not until the 15th century that it was first raised for fuel in England. On the continent of Europe the earliest coal known was in the 10th century, in the coal basin of the Rhine, and in the 11th century it was found in Spain.

It is a singular fact, that the earliest use of petroleum, is again distilled with other products, such as paraffine naphtha, and the residue of the distillation is used for such purposes as paraffine wax, etc. obtained. One of the products obtained from the heavy oils of coal tar is a substance called pitch, which is used for the coating material of the iron pipes, and the asphaltum is produced.

Thus we have from coal, tar, ammoniac, saltpetre, the volatile and heavy oils, and the acids, phosphoric, etc. One of the important products of coal is known as nitro-benzole, made by adding nitric acid to benzole. From this a coal

to pollute the air with coal smoke. The prejudice against coal in England continued down to the beginning of the 19th century when the country was still looking down to its own day. In America it is remarkable that the first discovery of this mineral should have been made as far in the west as the Illinois river valley. Dr. Hennepin in 1669, when he found the outcrop of a seam on the Illinois river, where the town of Ottawa now stands, gave the same local name to the mineral that from Virginia to New York has been for a long time supplied the whole Atlantic market. Anthracite had quite a struggle with bituminous coal for its value and use were not known. In fact, the first coal sent to Philadelphia in 1803 was considered worthless, and was broken up to use as the sidewalks. It took as long as a coal coal to get the American acquainted with its use during the present century on the Allegheny. The first practical attempt at

distributed by pipe-
lines to the various parts of the city, and was burned in very special apparatus which could be opened and closed at will. It also constructed portable gas-holders made of tin plate, which could be carried about the city in the streets. In 1792 to 1802, Mr. Murdoch made many experiments in gas-lighting, and, upon the occasion of the national illumination at the Theatre Royal, on the 12th of May 1799, he lighted up a portion of Bolton & Watts' factory at Soho, near Birmingham, with a public display of gas lights. This was the first time that gas was used for gas-lighting upon a tolerably large scale. This system of gas illumination gradually received the attention which its importance demanded, and it has since been extensively used in the products of coal tar to which it is applied. In 1825, when the first gas-works were established at Redruth, in Cornwall, the gas generated in the area retort from which it passed into a gasometer, being thence

THE COAL TAR DYES

is such that it is calculated that one millionth of a grain of mægala will give to a white cloth a yellowish tinge, and it is doubtful whether the earlier coal tar dyes were produced from the lightest or the heaviest products of coal (henzole) or whether they were obtained from the middle products of the distillation obtained from the heavier and less volatile

the extensive and systematic use of cotton mills of Phillips & Lee in Manchester Eng. where a gas apparatus was fitted up by J. M. Sturrock, capable of giving off 3000 cubic feet of gas per hour, and about 3000 candles. Two years after—in August, 1807—gas-lighting was first introduced into London, near the old House of Commons, and since that time has been promoted with increased zeal. Many public companies in London and the provinces were established, and by the year 1823 its use had become general, and in 1825 it became almost general. Some years later gas-lighting was introduced into the United States, and so rapid was the growth of the system in a few years from its first introduction it was found to be one of the principal cities of the Union.

As the details of a chemical analysis of coal might not be of interest to the general reader, we will only mention a few facts, especially to the chief products of coal, which have long been chiefly employed as lubricants for machinery and being so extensively looked upon as nearly waste products, have been hitherto almost unexamined, and therefore mysterious compounds that the scientist covets to know. The process of its formation of such product obtained at different groves of the chem is now discussed in the compressive waste, amount of waste and the various uses of the waste, which have been made by the various coal companies, and the subject is not yet considered as dry, or has been thoroughly worked out by the chemists. The following is a list of the house of A. Johnston an interesting work entitled "The History of a Lump of Coal from the P.T.S. Mount to a Bonfire." The book is a classic, and is a most interesting and useful work, and is a most interesting and useful work, and is a most interesting and useful work.

structure installation during the process of gas making for illuminating purposes. If the gas is made from coal in an ordinary grate, we put it in

LARGE IRON RETORT.

having a furnace fire beneath, as they do at the gas works, and distill over and collect in proper receivers everything the coal contains, but the coke (which remains in the retort) is sold for fuel. It is the product of very interesting and valuable processes, and these, when treated by certain chemical processes, will give us most astonishing results. When coal is heated in a retort, it is first carbonized, and the volatile retort becomes boiler, volatile or gaseous matters become separated from the heated mass, and as far as water, impurities, and other volatile matters are concerned, discover in considerable quantity, as also hydrogen gas, carbonized hydrogen and other gaseous matters which become liber-

use to expect it to contain a pungent substance, such as ammonia, neither would we think that a bright, clear spirit, like alcohol or benzole, is obtainable from Agave, we would suspect that an analgesic having the smell of oil of bitter almonds could be extracted, or that colors rivaling some of the brightest in nature could be obtained from the distillate of Agave. Nevertheless, these and many other useful substances are obtained from coals thus may be briefly explained. When coals are heated in a retort, the gas that issues is great carbonaceous gas, which the great commercial products are obtained—gas, tar and coke. The gas being used for illuminating purposes and the coke for making iron, the tar is the residue that is applied by distilling it over steam, and is used in painting iron fences, iron underground pipes, etc. and we shall find that it is a compound capable of yielding a large number of other useful and important products to which such names as aniline, antracene, naphthalene, etc. have been

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ed from the bottom of the tank into large stills, and is then subjected to a moderate distillation, which separates the volatile sulphide of ammonium (a compound of sulphur and ammonia) and some of the more volatile products pass over into the receiver, and the residue is treated with acid, and ammoniacal liquor and first light oils (Crude coal naphtha). When these cease to flow, the heat is increased, and a series of heavier products, called heavy oils, and which are even collected into and from other receiver, and finally what are called heavy oils, and when these last products cease to flow, the operation is completed, the remaining bit-pike remains in the still. In separating the various substances contained in the products of this distillation, certain chemical treatment is applied, and the thermometer is constantly depended upon as a guide in disengaging the lighter products from those of greater density. In this way benzine or benzole is separated from the whole, which is

and; the carbonates or oxars the chief impurities, which deposit in the form of a heavy black acid mass resembling tar. The clearest oil is then separated and distilled once after which it is again distilled, when a lighter oil is obtained, a naphtha, in fact. When this has been obtained clear, a good burning oil is obtained by increasing the heat of the still up to a certain temperature. When all these light or volatile oils have been distilled over, the rest and the head of the still again raised, the last product which passes over is a heavy oil, from which, on cooling,

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